

# THE JOURNAL OF THORACIC AND CARDIOVASCULAR SURGERY

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*Marko Turina, MD, Zurich, Switzerland*

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*Abe DeAnda, Jr, MD, and Leora B. Balsam, MD, New York, NY*

### Congenital Heart Disease (CHD)

- 1346 Primary sutureless repair for “simple” total anomalous pulmonary venous connection: Midterm results in a single institution**



*Bobby Yanagawa, MD, PhD, Abdullah A. Alghamdi, MD, MSc, Andreea Dragulescu, MD, Nicola Viola, MD, Osman O. Al-Radi, MD, Luc L. Mertens, MD, PhD, John G. Coles, MD, Christopher A. Caldarone, MD, and Glen S. Van Arsdell, MD, Toronto, Ontario, Canada*

Sutureless repair for primary surgical management of “simple” total anomalous pulmonary venous connection was compared with conventional repair. A higher rate of decline in postoperative right ventricular systolic pressure was seen in the sutureless repair group. Outcomes of survival and development of pulmonary vein stenosis were not different.

- 1355 Concomitant stenting of the patent ductus arteriosus and radiofrequency valvotomy in pulmonary atresia with intact ventricular septum and intermediate right ventricle: Early in-hospital and medium-term outcomes**  
*Mazeni Alwi, MRCP, Kok-Kuan Choo, MRCP, Nomee A. M. Radzi, MRCPCH, Hasri Samion, MD, Kiew-Kong Pau, FRCS, and Chee-Chin Hew, FRCS, Kuala Lumpur, Malaysia*

A total of 37 patients with pulmonary atresia with intact ventricular septum and intermediate right ventricle underwent concomitant patent ductus arteriosus (PDA) stenting at the time of radiofrequency-assisted valvotomy and balloon dilatation (RFV). At a median follow-up of 4 years, 48% attained biventricular circulation and 26% 1½-ventricle repair. Concomitant PDA stenting and RFV is feasible and safe with encouraging medium-term outcome.

- 1362 Cavopulmonary pathway modification in patients with heterotaxy and newly diagnosed or persistent pulmonary arteriovenous malformations after a modified Fontan operation**   
*Doff B. McElhinney, MD, Gerald R. Marx, MD, Audrey C. Marshall, MD, John E. Mayer, MD, and Pedro J. del Nido, MD, Boston, Mass*

In patients with polysplenia and unilateral pulmonary arteriovenous malformations due to hepatic venous flow-streaming after Fontan completion, cavopulmonary pathway reconfiguration with hepatic vein-azygous vein connection improves hypoxemia, supporting the importance of hepatic venous blood in the pathogenesis of pulmonary arteriovenous malformations and the practice of Fontan revision in such patients.

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## 1371 Surgical management of complete atrioventricular septal defect: Associations with surgical technique, age, and trisomy 21

Andrew M. Atz, MD, John A. Hawkins, MD, Minmin Lu, MS, Meryl S. Cohen, MD, Steven D. Colan, MD, James Jagers, MD, Ronald V. Lacro, MD, Brian W. McCrindle, MD, MPH, Renee Margossian, MD, Ralph S. Mosca, MD, Lynn A. Sleeper, ScD, and L. LuAnn Minich, MD, for the Pediatric Heart Network Investigators, Charleston, SC; Salt Lake City, Utah; Watertown and Boston, Mass; Philadelphia, Pa; Durham, NC; Toronto, Ontario, Canada; and New York, NY

Mortality and morbidity are low after complete atrioventricular septal defect repair regardless of surgical technique or presence of trisomy 21. Age at repair  $\leq 2.5$  months and concurrent surgical procedures are not associated with residual defects or degree of left atrioventricular valve regurgitation, but are associated with longer postoperative ventilator, intensive care unit, and total hospital duration.

## 1380 Totally thoracoscopic repair of atrial septal defect without robotic assistance: A single-center experience

Zeng-Shan Ma, MD, PhD, Ming-Feng Dong, MD, Qiu-Yang Yin, MD, Zhi-Yu Feng, MD, and Le-Xin Wang, MD, PhD, Liaocheng, Shandong, China, and Wagga Wagga, Australia

Forty patients (23 female patients; average age,  $15.4 \pm 8.7$  years) with secundum-type atrial septal defects (ASDs) were selected for totally endoscopic repair of ASDs through small incisions on the chest without robotic assistance. Through 3-port incisions in the right chest, pericardiotomy, bicaval occlusion, atriotomy, and ASD repair were performed by a surgeon through a thoracoscopy. The cardiopulmonary bypass and aortic crossclamp times were  $56.2 \pm 21.1$  and  $38.3 \pm 8.6$  minutes, respectively. The length of stay in the intensive care unit was  $23.0 \pm 4.1$  hours. There were no mortalities and no major complications in this cohort. Patients were discharged from the hospital 4 to 6 days after the operation. Transesophageal echocardiographic analysis immediately after the operation and at 30 days showed complete closure of the defect without residual shunt. We conclude that totally endoscopic ASD repair can be achieved without a robotically assisted surgical system. This technique is safe and effective and can be used as a therapeutic option for ASD.

## General Thoracic Surgery (GTS)

## 1384 Multicenter analysis of high-resolution computed tomography and positron emission tomography/computed tomography findings to choose therapeutic strategies for clinical stage IA lung adenocarcinoma



Morihito Okada, MD, PhD, Haruhiko Nakayama, MD, PhD, Sakae Okumura, MD, PhD, Hiromitsu Daisaki, PhD, Shuji Adachi, MD, PhD, Masahiro Yoshimura, MD, PhD, and Yoshihiro Miyata, MD, PhD, Hiroshima, Yokohama, Tokyo, and Akashi, Japan

This multicenter study using a phantom study to correct inter-institutional variability of PET/CT findings shows that maxSUV is a significant preoperative predictor for surgical outcomes. HRCT and PET/CT findings are important to select therapeutic strategies for treating clinical stage IA adenocarcinoma of the lung, such as sublobar resection.

## 1392 Impact of neoadjuvant chemoradiotherapy followed by surgical resection on node-negative T3 and T4 non-small cell lung cancer

Benedict D. T. Daly, MD, Michael I. Ebricht, MD, Allan J. Walkey, MD, Hiran C. Fernando, MBBS, Ken S. Zaner, MD, PhD, Donna M. Morelli, BS, and Lisa A. Kachnic, MD, Boston, Mass

Patients with invasive node-negative T3 and T4 non-small cell lung cancer receiving concurrent chemoradiotherapy before surgical resection have significantly improved survival.

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## 1398 Sternal dehiscence in patients with moderate and severe chronic obstructive pulmonary disease undergoing cardiac surgery: The value of supportive thorax vests

Sezai Celik, MD, Ahmet Kirbas, MD, Onur Gurer, MD, Yahya Yildiz, MD, and Omer Isik, MD, Istanbul, Turkey

The effect of moderate and severe COPD on the development of sternal dehiscence and the use of the Robicsek technique for sternal closure along with a sternal support vest postoperatively in the incidence of sternal dehiscence were evaluated in patients with moderate and severe COPD undergoing cardiac surgery.

## 1403 Ten-year experience with the muscle split technique, bioabsorbable plates, and postoperative bracing for correction of pectus carinatum: The Innsbruck protocol

Barbara Del Frari, MD, and Anton H. Schwabegger, MD, MSc, Innsbruck, Austria

The combination of the muscle split technique and absorbable osteosynthesis is an option in thoracoplastic repair of pectus carinatum. Postoperative bracing is furthermore an important adjunct in the successful treatment of these patients with respect to the final aesthetic outcome.

## Acquired Cardiovascular Disease (ACD)

## 1410 Effectiveness of dabigatran etexilate for thromboprophylaxis of mechanical heart valves

Stephen H. McKellar, MD, MSc, Stuart Abel, BS, Christopher L. Camp, MD, Rakesh M. Suri, MD, DPhil, Mark H. Ereth, MD, and Hartzell V. Schaff, MD, Rochester, Minn

Mechanical valve prostheses necessitate lifelong anticoagulation. Warfarin has limitations, including 1% to 2% per year stroke incidence. Dabigatran etexilate does not have warfarin's limitations but has not been tested in this setting. Positive preclinical data show that dabigatran etexilate may provide an alternative to warfarin for patients with mechanical valves.

## 1417 Open arch reconstruction in the endovascular era: Analysis of 721 patients over 17 years

Himanshu J. Patel, MD, Christopher Nguyen, BS, Amy C. Diener, RN, BSN, Mary C. Passow, RN, BSN, Diane Salata, RN, BSN, and G. Michael Deeb, MD, Ann Arbor, Mich

We present results with open aortic arch reconstruction over a 17-year period, reflecting the results in the endovascular era. These data may be suitable for comparison and suggest that certain subgroups, including those with advanced age or impaired renal function, may be ideal candidates for emerging endovascular options.

## 1424 Impact of pulmonary hypertension on outcomes after aortic valve replacement for aortic valve stenosis



Spencer J. Melby, MD, Marc R. Moon, MD, Brian R. Lindman, MD, Marci S. Bailey, RN, MSN, Laureen L. Hill, MD, and Ralph J. Damiano, Jr, MD, St Louis, Mo

Pulmonary hypertension (PH) is common among patients undergoing AVR for stenosis. Patients undergoing AVR with PH had increased operative mortality and decreased long-term survival, and those with persistent PH fared worst. Because PH has an adverse affect on outcomes, it should be considered in preoperative risk assessment.

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## 1431 Tricuspid annuloplasty prevents right ventricular dilatation and progression of tricuspid regurgitation in patients with tricuspid annular dilatation undergoing mitral valve repair

Nico R. Van de Veire, MD, PhD, Jerry Braun, MD, Victoria Delgado, MD,

Michel I. M. Versteegh, MD, Robert A. Dion, MD, PhD, Robert J. M. Klautz, MD, PhD, and

Jeroen J. Bax, MD, PhD, Leiden, The Netherlands

In patients with a dilated tricuspid annulus undergoing mitral valve repair without concomitant tricuspid valve annuloplasty, echocardiographic outcome was worse at the 2-year follow-up. In contrast, patients with tricuspid annular dilatation undergoing concomitant mitral valve repair and tricuspid valve annuloplasty demonstrated reverse right ventricular remodeling and reduction of tricuspid regurgitation.

## 1440 The Mosaic porcine bioprosthesis: Role of age on clinical performance in aortic position

Friedrich-Christian Rieß, MD, Ralf Bader, MD, Eva Cramer, MD, Lorenz Hansen, MD,

Sandra Schiffelers, Jürgen Wallrath, and Gunter Wahl, MD, Hamburg, Germany, and

Maastricht, The Netherlands

We examined the performance of the Mosaic bioprosthesis in patients 65 years of age or less and patients older than 65 years. In both groups similar hemodynamic performance was found. In the younger patients the incidence of structural valve disease, endocarditis, valve-related reoperation, and explantation is higher, and the incidence of structural valve deterioration is similar or lower.

## 1449 St Jude Medical Epic porcine bioprosthesis: Results of the regulatory evaluation

W. R. Eric Jamieson, MD, Clifton T. P. Lewis, MD, Marc P. Sakwa, MD, Denton A. Cooley, MD,

Vibhu R. Kshetry, MD, Kent W. Jones, MD, Tirone E. David, MD, John A. Sullivan, MD,

Guy J. Fradet, MD, and David S. Bach, MD, Vancouver, British Columbia, Toronto, Ontario, and

Halifax, Nova Scotia, Canada; Sarasota, Fla; Royal Oak and Ann Arbor, Mich; Houston, Tex;

Minneapolis, Minn; and Salt Lake City, Utah

The St Jude Medical Epic tricomposite glutaraldehyde-preserved porcine bioprosthesis was implanted in 761 patients in the US Food and Drug Administration regulatory study in 22 investigational centers. The actuarial freedom from SVD was satisfactory at 4 years. There were 2 cases of AVR perforation without calcification. There were no MVR cases of SVD.

## 1455 Up to 6-year follow-up after pulmonary vein isolation for persistent/permanent atrial fibrillation: Importance of sinus node function

Yoshiharu Soga, MD, PhD, Hitoshi Okabayashi, MD, PhD, Yoshio Arai, MD, PhD,

Takuya Nomoto, MD, PhD, Jota Nakano, MD, Takehiko Matsuo, MD, and

Michiya Hanyu, MD, PhD, Ikoma, Morioka, and Kitakyushu, Japan

The cure rate of persistent/permanent AF after pulmonary vein isolation was significantly poorer in patients with sinus node dysfunction than in patients with normal sinus node function. Cut-and-sew pulmonary vein isolation may be an adequate treatment for persistent/permanent AF in patients with normal sinus node function.

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## 1461 Less invasive versus conventional double-valve surgery: A propensity-matched comparison

*Fernando A. Atik, MD, Lars G. Svensson, MD, PhD, FACC, Eugene H. Blackstone, MD, FACC, A. Marc Gillinov, MD, FACC, Jeevanantham Rajeswaran, MSc, and Bruce W. Lytle, MD, FACC, Cleveland, Ohio*

Less invasive approaches to double-valve surgery are increasingly used for improved cosmesis; however, few studies investigate their effect on outcome. We compared these less invasive approaches with full sternotomy using propensity matching and found that less invasive approaches had blood-use advantages and no apparent detriments.

## Perioperative Management (PM)

## 1469 Administration of recombinant activated factor VII in the intensive care unit after complex cardiovascular surgery: Clinical and economic outcomes

*Walter E. Uber, PharmD, John M. Toole, MD, Martha R. Stroud, MS, Jason S. Haney, PharmD, John Lazarchick, MD, Fred A. Crawford, Jr, MD, and John S. Ikonomidis, MD, PhD, Charleston, SC*

Recombinant activated factor VII administration to patients in the intensive care unit appears to be comparable with reoperation for refractory bleeding after complex cardiovascular surgical procedures and might be considered as an alternative to reoperation in selected patients. Future prospective, randomized controlled trials are needed to clearly validate these findings.

## 1478 Landiolol hydrochloride for prevention of atrial fibrillation after coronary artery bypass grafting: New evidence from the PASCAL trial

*Akira Sezai, MD, PhD, Kazutomo Minami, MD, PhD, Toshiko Nakai, MD, PhD, Mitsumasa Hata, MD, PhD, Isamu Yoshitake, MD, PhD, Shinji Wakui, MD, PhD, Motomi Shiono, MD, PhD, and Atsushi Hirayama, MD, PhD, Tokyo, Japan*

Postoperative atrial fibrillation was reduced by treatment with landiolol hydrochloride, an ultrashort-acting beta-blocker. Amelioration of ischemia, an anti-inflammatory effect, and inhibition of sympathetic hypertonia by landiolol presumably reduced the occurrence of atrial fibrillation.

## 1488 Cardiopulmonary bypass in malignant hyperthermia susceptible patients: A systematic review of published cases

*Thomas Metterlein, MD, Wolfgang Zink, MD, Eva Kranke, RN, Assad Haneya, MD, Bernhard Graf, MSc, MD, and Peter Kranke, MD, Regensburg and Würzburg, Germany*

Malignant hyperthermia is a potentially lethal complication of general anesthesia. Symptoms of malignant hyperthermia may be obscured during cardiopulmonary bypass. A systematic search was conducted to identify signs that allow an early appropriate diagnosis. Further, treatment and prophylaxis of malignant hyperthermia during cardiac surgery are discussed.

## 1496 Changes in cysteinyl leukotrienes during and after cardiac surgery with cardiopulmonary bypass in patients with and without chronic obstructive pulmonary disease

*Nicolas de Prost, MD, PhD, Claudine El-Karak, MD, Maria Avila, MD, Fumito Ichinose, MD, PhD, and Marcos F. Vidal Melo, MD, PhD, Boston, Mass*

During and after cardiac surgery with cardiopulmonary bypass, patients with chronic obstructive pulmonary disease had larger airway resistances, deeper hypoxemia, and longer-lasting postoperative mechanical ventilation than those without chronic obstructive pulmonary disease. Urinary cysteinyl leukotriene concentrations increased with time in both groups, but more in patients with chronic obstructive pulmonary disease.

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## Evolving Technology/ Basic Science (ET/BS)

### 1503 Interaction between neoplastic cells and cancer-associated fibroblasts through the CXCL12/CXCR4 axis: Role in non-small cell lung cancer tumor proliferation

*Ori Wald, MD, PhD, Uzi Izhar, MD, Gail Amir, MD, Sophie Kirshberg, BSc, Zippora Shlomai, MSc, Gideon Zamir, MD, Amnon Peled, PhD, and Oz M. Shapira, MD, Jerusalem, Israel*

Findings suggest that the interaction between cancer-associated fibroblasts and tumor epithelial cells via the CXCL12/CXCR4 axis play a role in non-small cell lung cancer tumor proliferation and mark the CXCL12/CXCR4 axis as a target for immune intervention in treating this entity.

### 1513 Calcification of allograft and stentless xenograft valves for right ventricular outflow tract reconstruction: An experimental study in adolescent sheep

*Willem Flameng, MD, PhD, Ramadan Jashari, MD, Geofrey De Visscher, PhD, Lindsay Mesure, MSc, and Bart Meuris, MD, PhD, Leuven and Brussels, Belgium*

This experimental study shows the superiority of pulmonary homografts over aortic homografts for right ventricular outflow tract reconstruction. Stentless porcine xenografts and bovine jugular vein conduits are an acceptable alternative because they have low cusp calcification and no leaflet tearing or cusp immobilization. However, significant wall calcification develops despite any anticalcification treatment.

### 1522 An artificial nanoemulsion carrying paclitaxel decreases the transplant heart vascular disease: A study in a rabbit graft model

*Domingos D. Lourenço-Filho, MD, PhD, Raul C. Maranhão, MD, PhD, Carlos A. Méndez-Contreras, MD, Elaine R. Tavares, BSc, Fatima R. Freitas, PhD, and Noedir A. Stolf, MD, PhD, São Paulo, Brazil*

Eleven rabbits with heart grafts were treated with paclitaxel associated with a cholesterol-rich nanoemulsion (LDE) in addition to cyclosporin A. Compared with 10 grafted control animals, rabbits receiving LDE-paclitaxel treatment showed a 50% reduction in stenosis in grafted hearts, whereas the arterial lumen was 3-fold larger than in control hearts. Macrophage infiltration in grafts decreased 7-fold.

### 1529 Controlled hyperkalemic reperfusion with magnesium rescues ischemic juvenile hearts by reducing calcium loading

*Hajime Imura, MD, Hua Lin, MSc, Elinor J. Griffiths, PhD, and M.-Saadeh Suleiman, PhD, DSc, Tokyo, Japan, and Bristol, United Kingdom*

Juvenile guinea-pig hearts were subjected to ischemia and controlled hyperkalemic reperfusion without or with different concentrations of  $Mg^{2+}$  without intervention during ischemia. Elevated  $Mg^{2+}$  rescued the heart even when hyperkalemia alone was not protective. Studies on myocytes showed this was likely due to reducing  $[Ca^{2+}]_i$ , which aids metabolic recovery.

## Cardiothoracic Imaging

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*Sotiris C. Stamou, MD, and Nicholas T. Kouchoukos, MD, St Louis, Mo*

### 1539 High-resolution computed tomography with three-dimensional reconstruction for assessment of chronic pulmonary thromboembolic disease

*Thoralf M. Sundt, MD, and Eric E. Williamson, MD, Rochester, Minn*

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*Krishnan Ganapathy Subramaniam, MCh, Kulasekharan Marimuthu, MCh, Krishna Manohar, MCh, Sudeep Verma, MD, and Kotturathu Mammen Cherian, FRACS, Chennai, India*
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*Masafumi Noda, MD, Yoshinori Okada, MD, Sumiko Maeda, MD, and Takashi Kondo, MD, Sendai, Japan*
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*Tom Waterbury, MPS, CCP, LP, Thomas J. Clark, BS, Scott Niles, BS, and Robert Saeid Farivar, MD, PhD, Iowa City, Iowa*
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- 1554 Ralph Lewis, MD: A pioneer in thoracic surgery**  
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